# ABSTRACT

The invention is a method for simulating one or more characteristics of a

5   multi-component, hydrocarbon-bearing formation into which a displacement fluid having at least one component is injected to displace formation hydrocarbons. The first step of the method is to equate at least part of the formation to a multiplicity of gridcells. Each gridcell is then divided into two regions, a first region representing a portion of each gridcell swept by the displacement fluid and a second region

10  representing a portion of each gridcell essentially unswept by the displacement fluid. The distribution of components in each region is assumed to be essentially uniform. A model is constructed that is representative of fluid properties within each region, fluid flow between gridcells using principles of percolation theory, and component transport between the regions. The model is then used in a simulator to simulate one or more

15  characteristics of the formation.